

AMRAD NEWSLETTER

Amateur Radio Research and Development Corporation

April 1981

OUR APRIL 6 MEETING has been superseded by the ARRL Technical Symposium, run by AMRAD, on April 6 at 7:30 p.m. at the Capital Hilton Hotel, 16th and K Streets, NW, Washington, DC.

Admission for this event only is \$3 unless you have registered for the IEEE Vehicular Technology Society Annual Meeting, in which case the admission is included. The IEEE VTS Annual Conference is held at the same hotel April 6-8.

The Technical Symposium will be moderated by Dr. Stephen J. Lukasik, Chief Scientist, Federal Communications Commission. The following papers will be presented:

Amateur Radio Spread Spectrum, Hal Feinstein, WB3KDU, Secretary, AMRAD Spread Spectrum Special Interest Group.

High Dynamic Range Mixers, George Collins, ADØW, ARRL Technical Department.

High Efficiency Linear Amplifiers, Nathan O. Sokal, WA1HQC, President, Design Automation Inc.

Packet Radio, David W. Borden, K8MMO, AMRAD Newsletter Protocol Editor

Radioteletype Demodulation, Robert E. Watson, Watkins-Johnson Company.

For information on the IEEE Conference, contact Gaspar Messina, 9800 Marquette, Bethesda, MD 20034, 202-632-6450 (FCC).

OUR MAY 4 MEETING will feature a discussion of packet radio led by Dave Borden, K8MMO. This will not be the same as the above paper being given by Dave at the ARRL Technical Symposium. The purpose of this meeting is to discuss various ways of getting started on packet radio and to provide an opportunity for questions and answers. There will be at least 4 AMRAD stations on the 2-meter repeater with 1200-baud packets soon. We'd like some company and are interested in helping others get going. Also, you'll learn more about what we're doing with respect to the HF packet radio link being set up between AMRAD and the ARRL.

DON'T FORGET THE ROANOKE DIVISION LPM 81 set for May 9-10 at the Tyson's Corner Ramada Inn. LPM stands for League Planning Meeting, an opportunity for individuals and clubs to let their ARRL Director and Vice Director know what's on their minds. The series of these meetings, formerly known as LO (League Officials) meetings, has resulted in numerous resolutions which have found their way into positive actions taken by the ARRL board of directors.

AMRAD has organized a technical program for the LPM, tentatively scheduled to come off at 1630 on Saturday, May 9. Dr. Michael J. Marcus of the FCC's Office of Science and Technology has agreed to act as moderator. Dr. Thomas Clark, W3IWI, president of AMSAT will address the group, as will David W. Borden, K8MMO to talk about packet radio networking.

AMRAD OFFICERS MET WITH DOUG LOCKHART, VE7APU, in Philadelphia, PA on March 7. Doug happened to be in New York for a three-week training course, so we decided to meet half way. Representing AMRAD were Dave Borden, K8MMO; Terry Fox, WB4JFI; Paul Rinaldo, W4RI; and, Sandy, WB5MMB. It was nice meeting Doug, especially after talking to him on 20-meter SSB for a number of weeks every Saturday at 1200 EST. We talked about our progress in getting some Terminal Node Controllers going (see 2-page ad in this issue). Doug is now working on a Station Node Controller on an S-100 card. We reviewed the specifications that Doug had written for a single-board 220-MHz packet repeater with receiver, transmitter and modem on board. The idea here is to come up with a low-cost board which will permit putting these repeaters in numerous locations throughout the U.S. and Canada. The same board can be used both as a digital repeater and terminal station, the terminal being what you would have at home. AMRAD may get involved in the design of the 220-MHz board, pending word from a group in California that is now looking at the design problem. AMRAD members who are interested in participating in this design project should advise Paul Rinaldo, W4RI. All in all, it was an interesting day with Doug -- time well spent.

THE FCC GRANTED AMRAD AN STA FOR SPREAD SPECTRUM EXPERIMENTATION on March 6. Because the Commission considered this STA a significant one, we were invited to the office of the Chief of the Private Radio Bureau to receive the STA which is reproduced on the following page. In reading the STA, you should be aware that the attachment applies only to proposed 420-MHz operation.

AMRAD's proposal requested permission to conduct 4 experiments:

- #1. HF Frequency Hopping experiments on 80, 40 and 20 meter bands using commercial equipment made available via K2SZE.
- #2. 10-Meter Frequency Hopping using homebrew equipment, some built around converted CB transceivers.
- #3. UHF Direct Sequence tests using homebrew equipment, including tests via the WR4AAG ATV repeater.
- #4. EME Spread Spectrum experiments using the 84-foot dish at Cheltenham, MD for moon bounce tests.

Currently covered by the STA are:

Glenn W. Baumgartner, KA0ESA
Robert A. Buaas, K6KGS
Thomas A. Coffee, W4PSC
Charles E. Conner, K0NG
Roger Cox, WBDGF
Werner A. Fehlauer, WB2BRB
Hal L. Feinstein, WB3KDU
Terry Fox, WB4JFI
Michael J. DiJulio, WB2BWJ
Allan H. Kaplan, W1AEL
Richard J. Kessler K2SZE
Joe H. Mehaffey, Jr., K4IHP
John J. Nagle, K4KJ
James P. Osburn, WD9EYB
Travis W. Pederson, N5TP
Raymond C. Petit, W7GHM
Charles O. Phillips, K5LMA
David H. Phillips, W3PJM
Olaf Norris Rask, WA3ZXW
Alexander H. Riccio, W2NBJ
Paul L. Rinaldo, W4RI
David B. Ritchie, N6DLU
John H. Sharpe, WD5JYF
Gerald W. Swartzlander, KG6Y
A. Brent White, W7LUJ
Glenn S. Williman, N2HW
Stephen Ray Wimmer, WB0GGT
Caltech ARC, W6UE

Theodore J. Prentlinger, WB9QFE has completed a letter of participation which we held onto while the STA was being finalized. Any others wishing to make a serious contribution to this experimentation should get in touch with Hal Feinstein, Secy SSSig, 1410 Rhodes St N, Arlington, VA 22209, 703-524-9116 (home). Any additional letters of participation should reach Hal by the end of April so we can submit them to the FCC as a group. Check with Hal for wording of the letter. Also let Hal know how you plan to contribute to the experiments or support.

ROBERT N DYRUFF, W6POU, new AMRAD member and Section Communications Manager of the ARRL Santa Barbara Section, has filled us in on data communications activities there. He has been concerned about how data communications can be applied to emergencies. On January 24 a one-day conference on data communications was convened in Santa Barbara, CA to encourage discussion by knowledgeable radio amateurs of the need for data communications for crisis relocation and other emergencies. Standards reached at that meeting are reproduced later in this issue. Any comments should be directed to Bob at 1188 Summit Rd, Santa Barbara, CA 93108, 805-969-3073. Also, please send a drop copy to the AMRAD Newsletter.

THE GEORGE WASHINGTON UNIVERSITY School of Engineering and Applied Science is offering the following short courses of possible interest to our members in the Washington, DC area:

- 632 Vulnerability of Spread Spectrum Communications, May 4-6
- 535 Digital Transmission Systems Engineering, May 11-15
- 689 Electronic Mail: Technologies and Policy Issues, May 21-22
- 589 Packet Switching Protocols, May 27-29
- 388 Software Design for Data Communication Systems, June 8-10
- 241 Modern Data Communications, June 8-12
- 828 Computer Communications Concepts, June 29-30

GWU's address is simply Washington, DC 20052. They can also be contacted by phone at 202-676-6106 or 800-424-9773.

TECHNOLOGY SERVICE CORP, 8555 16th St, Silver Spring, MD 20910, 301-565-2970, is running the following short courses at the Holiday Inn of Bethesda, MD:

Modern Antenna Measurements, May 5-8
Communications Traffic Engineering, May 13-15

SOME USEFUL BOOKS ON CP/M:

Bruce A. Brigham, CP/M Summary Guide, Rainbow Assoc, PO Box 35, Glastonbury, CT 06025, \$4.

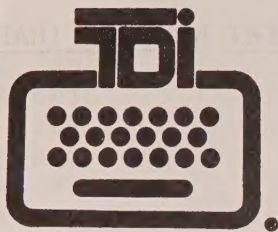
Rodnay Zaks, The CP/M Handbook with MP/M, SYBEX, Inc, ISBN 0-89588-048-2 (about \$10).

Stephen M. Murtha & Mitchell Wait, CP/M Primer, Howard W. Sams & Co, ISBN 0-672-21791-0, \$11.95. Try Arcade in Annandale, VA.

Judi N. Fernandez, Ruth Ashley, Using CP/M - a self-teaching guide, John Wiley & Sons, \$8.95.

CP/M is a trademark of Digital Research.

McGRAW-HILL ANNOUNCES plans to supersede the quarterly *onComputing* with a monthly called *Popular Computing*, which will appear with their November 1981 issue. Write: 70 Main St, Peterborough, NH 03458.



THE DEAF AND THE TTY

Barry Strassler
Executive Director
Telecommunications for the Deaf, Inc.
814 Thayer Avenue
Silver Spring, Maryland 20910
TTY 301-589-3006

The Networking Concept for the Deaf

In the past few weeks I have been heavily involved in discussions with interested parties to introduce electronic mail to the deaf Baudot TDD users on a nationwide scale.

DEAFNET (in the Washington, DC area) will cease to exist as a Federally funded project as of December 31, 1981. This heightens the need to develop private funding sources, and TDI has been hard at work on this end.

I visited Knoxville, TN at the invitation of a local organization to advise them on starting a computerized answering service. I accompanied a group of people from the Deaf Community Center (Framingham, MA) when they were in town to seek ways to continue their ASCII-only electronic mail project. We were at GTE Telenet headquarters, at The Source headquarters and met with Paul Rinaldo and Dick Barth at the latter's residence. After the DCC people left, discussions continued with a commercial electronic mail firm and with Dr. Hugh Summers of the

Associations of Education of the Deaf (AED) and Rinaldo, again.

I am no technocrat but try to sop the wisdom and advice off others. And it seems that TDI (as well as AMRAD, as a cooperating consultant) is faced with these electronic mail options (for the deaf):

1. Retain the PDP 11/70 DEAFNET computer as a host to a cluster of satellite micro-computers in selected deaf communities.
2. Create a personal computer network in selected deaf communities.
3. Establish a deaf-only network on GTE Telemail or The Source.
4. Establish the AMNET network, working closely with AMRAD and the ARRL.

There are advantages and disadvantages to each option, and in the months to come, it is hoped that TDI will embark on a definite electronic mail path.

GETTING WORDSTAR WORKING ON AN APPLE II is supposed to be somewhat difficult, using the Microsoft SoftCard. To get the complete rundown on how to do it, see the March 2 issue of *InfoWorld*. U.S. subscriptions are \$18/year for 26 issues from InfoWorld, 375 Cochituate Rd, Framingham, MA 01701. Editorial Offices are at 530 Lytton Ave., Palo Alto, CA 94301.

InfoWorld's March 16 issue carries a clarification of the FCC's RFI rules as they apply to computer manufacturers. In a nutshell it says that single-board computers and S-100 mainframes (with cards inside) need to comply. Individual S-100 cards are considered to be subassemblies of an S-100 system and when sold individually are exempt from the FCC rules.

PERCOM DATA, Garland, TX 75042, is offering an SS-50 bus expander called the Color Connection for the TRS-80 Color Computer. The price is \$99.95, which includes application instructions.

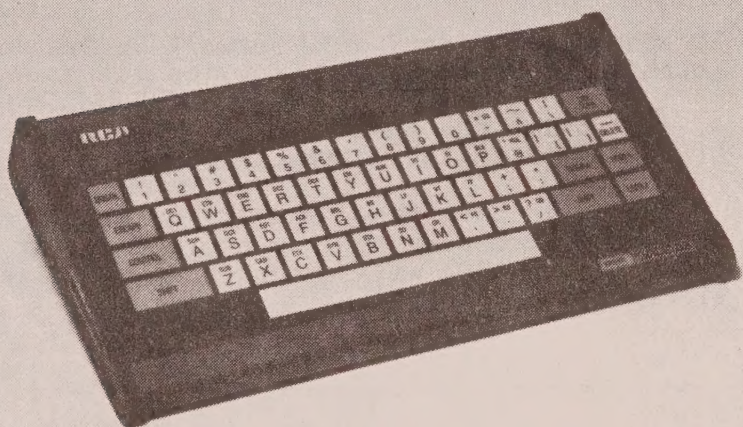
HAMLOG is the name of an automated amateur radio station log for use on the APPLE II computer with 48 kilobytes of RAM and DOS 3.3. It will log up to 2000 QSO's. The price is \$47 prepaid. Write: CECO Inc, 7654 Royce St, Annandale, VA 22003.

ELECTRONICS ENGINEERS with BSEE are sought for VLF-UHF, analog & digital positions in the Washington, DC area. Contact Thomas E. Mulhearn, Ability Search, Inc, 1629 K Street, NW, Washington, DC 20006, 202-296-1616.

64K x 1 dynamic RAM is starting to hit the market, both from U.S. and Japanese producers. One of the problems is lack of a standard refresh scheme. If you're interested, check Technico (in Maryland) for prices. For some background reading on the subject, you may be interested in seeing the February 1981 issue of *Electronic Products Magazine*, which lists manufacturers, prices and characteristics.

AMSAT SATELLITE REPORT is AMSAT's newest communications vehicle. ASR is intended as a newsletter for operational and organizational activities. But how does ASR relate to ORBIT? ORBIT does very well in its treatment of complex or lengthy matters in a concise, paced manner. ASR is meant to supplement the HF nets in coverage of current news. Subscriptions are \$18 per year for the U.S. and Canada; \$26 overseas. Make checks payable to "Satellite Report" and send to 221 Long Swamp Road, Wolcott, CT 06716.

ASR's PREMIERE ISSUE carried the news that the Ariane mystery is solved. The European Space Agency (ESA) says it's found the root cause of L02 failure which took AMSAT's Phase IIIA to submarine apogee. Subtle differences in machining Viking-V first stage engine injector nozzle set the stage for disastrous combustion chamber oscillation. New specs and thorough pre-testing of nozzles will preclude recurrence of the problem, according to ESA. The next launch, L03, is on for June 1981. AMSAT Phase IIIB is booked on L7 for February 24, 1982.



RCA HAS INTRODUCED a low-cost data terminal which includes color graphics. It is microprocessor controlled and features reverse video, programmable and resident character sets, selectable baud rates and data formats. The VP-3301 can be connected to a modem via an RS-232-C interface. The character format is 40 characters by 24 lines or 20 characters by 12 lines. Each character or all characters may be displayed in one of eight colors (or shades of gray on B&W display). Display background may be one of eight colors or gray shades. The baseband video output can be directly connected to a 525-line color or black-and-white video monitor or via an RF modulator to a standard color or B&W TV set. Price is \$369, delivery 90 days. For more information contact RCA MicroComputer Products, New Holland Ave, Lancaster, PA 17604, 717-397-7661.

Hmmm. I wonder how it would be for ATV.

HAMILTON AND AREA PACKET NETWORK (HAPN) sent us their Bulletin number 2 which, like the first one, was packed with information. We don't know what the annual dues will be, but \$10 should get their attention enough to receive some issues. HAPN's premiere issue cost them about \$10 to produce; it contains an extensive bibliography on digital communications. Number 2 includes a Bell-202 compatible modem by VE3DVB built around two XR chips. Doug Lockhart, VE7APU informs us that the Vancouver group has several variations on this theme. If you would like to receive the HAPN bulletins, write to Stu Beal, 2391 Arnold Cres, Burlington, Ontario, Canada L7P 4J2.

A CMOS IC DATABOOK IS AVAILABLE FROM RCA Solid State Division, Box 3200, Somerville, NJ 08876. The price is \$7.00 per copy. COS/MOS Integrated Circuits, SSD-250B replaces SSD-250A of August 1978 and includes technical data on all CD4000 circuits introduced since that date.

TRENDS AND APPLICATIONS 1981: Advances in Software Technology is a state-of-the-art conference describing new and advanced developments in software technology, to be held at the National Bureau of Standards, Gaithersburg, MD, on May 28, 1981. The conference will feature a panel discussion and papers on: software engineering, software quality control, software management, distributed processing, computer communications, programming and operating systems, secure software, database software, performance evaluation, and novel applications. The conference is sponsored by the National Bureau of Standards, the Washington DC Chapter of the IEEE Computer Society, and the IEEE Washington Section. A tutorial on software technology will be presented at the Washingtonian Motel, Gaithersburg, MD on May 27. For info write the IEEE Computer Society, PO Box 639, Silver Spring, MD 20901.

ACM PROFESSIONAL DEVELOPMENT SEMINARS have been announced by the Washington DC Chapter of the ACM, PO Box 39110, Washington, DC 20016. Seminars will be held at the University of Maryland, Center of Adult Education, College Park, MD. If you have questions call the ACM Chapter answering service at 202-296-4221, 8:30-5:30, Monday thru Friday. Seminars include:

- Understanding Computer Graphics, April 14
- Thinking Processes in the Systems Development Process, April 14
- Automated Tools for Software Engineering, April 28
- Computer Security/Privacy, April 21
- Standardization of Computer Resources, April 21
- Technical and Managerial Aspects of Office Automation, April 28

FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D. C. 20554

MAR 06 1981

IN REPLY REFER TO:
7110-19

Paul L. Rinaldo, W4RI
1524 Springvale Avenue
McLean, VA 22101

Dear Mr. Rinaldo:

The Commission has considered your request for Special Temporary Authority to conduct spread spectrum experiments in the Amateur Radio Service as requested by the Amateur Radio Research and Development Corporation (AMRAD). Subject to the following special conditions and limitations, the request is hereby granted.

The term of this operating authority shall be one year from the date of this correspondence. Upon expiration, the applicants shall submit their findings in report form to the Commission examining the relative merit of spread spectrum technology to spectrum efficiency.

All frequencies used shall be confined to the United States amateur radio frequency allocations for ITU Region 2, and an operating schedule shall be made available to the Commission upon request.

All operations shall be in strict conformance with Part 97 of the Commission's Rules and the enclosed attachment. To the extent set forth in your request, Section 97.61 has been waived to permit spread spectrum emission, and Section 97.117 has been waived to permit operation using a mathematical encryption code of your choice. Station identification shall be in accordance with your written proposal to the Commission. File a copy of this authorization with your station records.

This action is independent of any further action the Commission may take with respect to regular operating authority and will not prejudice the disposition of any formal application for these radio facilities.

Sincerely,

Richard H. Everett

Richard H. Everett
Chief, Licensing Division

ATTACHMENT

OPERATION WITHIN THE FOLLOWING AREAS REQUIRES THE APPLICANT TO OBTAIN OPERATING PERMISSION AT LEAST 10 WORKING DAYS PRIOR TO PROPOSED OPERATION FROM

Captain Gordon Mills, USAF
Hq SAC SXME
(402) 294-2932

- (a) In the State of Massachusetts within a 160 kilometer (100 miles) radius around the locations of Otis Air Force Base, Massachusetts (latitude 41° 45' North, longitude 70° 32' West).
- (b) In the State of California within a 240 kilometer (150 mile) radius around locations of Beale Air Force Base, California (latitude 39° 08' North, longitude 12° 26' West).
- (c) In the State of Alaska within a 160 kilometer (100 mile) radius around locations of Elmendorf Air Force Base, Alaska (latitude 64° 17' North, longitude 149° 10' West).
- (d) In the State of North Dakota within a 160 kilometer (100 mile) radius around locations of Grand Forks Air Force Base, North Dakota (latitude 48° 43' North, longitude 97° 54' West).

OPERATION WITHIN THE FOLLOWING AREAS REQUIRES PRIOR NOTIFICATION TO

Air Force Management Office
(202) 693-8260

- (a) Those portions of Texas and New Mexico bounded on the South by latitude 31° 45' North, on the East by longitude 104° 00' West, on the North by latitude 34° 30' North and on the West by longitude 107° 30' West.
- (b) Those portions of Texas and New Mexico bounded on the South by latitude 31° 53' North, on the East by longitude 105° 40' West, on the North by latitude 33° 24' North, and on the West by longitude 106° 40' West.
- (c) The entire State of Florida including the Key West area and the areas enclosed within a 200 mile radius of Patterson Air Force Base, Florida (latitude 28° 21' North, longitude 80° 43' West) and within a 200 mile radius of Elgin Air Force Base, Florida (latitude 30° 30' North, longitude 86° 30' West).
- (d) The entire State of Arizona.
- (e) Those portions of California and Nevada South of latitude 37° 10' North and the areas enclosed within a 200 mile radius of the U.S. Naval Missile Center, Point Mugu, California (latitude 34° 09' North, longitude 119° 11' West).

RECOMMENDED STANDARDS FOR DATA COMMUNICATIONS
between
AMATEUR RADIO and OFFICES OF EMERGENCY SERVICES
in
SOUTHERN CALIFORNIA
January 1981

I. Continued use of the national teletype standard 170Hz shift - 2125Hz/2295Hz pair on high frequency radio circuits employing either the eight-level ASCII code or the five-level Baudot code for an indefinite time period.

II. Use of the American Standard for Computer Information Interchange (ASCII) Code on all telephone and VHF/UHF radio circuits involving emergency services.

III. Use of the Bell 103 Standard on telephone lines and VHF/UHF radio circuits:

A. SIMPLEX (half-duplex) (one direction at-a-time) communications wherein the ORIGINATE station and the ANSWER station both transmit and receive on the "high" pair of tones - 2025Hz/2225Hz (200Hz shift).

B. DUPLEX (simultaneous bi-directional) communications on (two) circuits wherein:

- 1) the ORIGINATE station transmits on the "low" pair of tones - 1070Hz/1270Hz (200 Hz shift) to the ANSWER station; and
- 2) the ANSWER station transmits on the "high" pair of tones - 2025Hz/2225Hz (200 Hz shift) back to the ORIGINATE station.
- 3) radio repeaters are generally operated in the ANSWER mode (Receive "low" tones; transmit "high" tones)

IV. Use of the following standards will permit operation of system-independent software so as to ensure compatibility between a wide variety of manufactured equipments with a minimum of interface problems:

A. transmitting on the circuit only characters and numbers plus CARRIAGE RETURN (CR) and LINE FEED (LF), but no other control codes; i.e., sending only ASCII decimal characters #32 through #127 inclusive as well as #13 (CR) and #10 (LF) so as to minimize problems between equipments.

B. A line shall consist of no more than 70 characters and shall be terminated with a CARRIAGE RETURN (CR) and a LINE FEED (LF) so as to accommodate certain electromechanical devices.

V. Electrical Interconnections

A. Standardized Electrical Connectors to:

- 1) Connect modems to telephone lines
- 2) Connect modems to eight (8) ohm receiver audio outputs
- 3) Connect modems to nominal 500 ohm transmitter inputs
- 4) Connect modems to Input/Output ports of various computers

5) Provide for push-to-talk transmitter/receiver control

6) Provide alternately for voice audio over the same circuits for administrative and identification purposes

7) Provide for half-duplex or full duplex connections and switching

B. Recommended formation of a special interest group to determine the joint standards of agencies and volunteers concerned with equipment inter-connections.

It is to be expected that continuing Amateur Radio experimentation will occur nationally on various modes, tones, shifts, speeds, etc., as may prove worthy of exploration and development of the art. Such fields will include, and are not limited to: machine sent continuous wave, packet radio, computer-to-computer file exchanges, computer radio and bulletin networks and mailboxes, automatic traffic handling between regions, spread spectrum techniques affording simultaneous use of frequencies by multiple users, facsimile-style (page-at-a-time) computer-generated text via amateur television, etc.

I hope the above information on standards will be of value to you and I look forward to hearing of the conclusions reached at the State level.

Sincerely,

Robert N. Dyruff, W6PCU

cc: Jay A. Holladay, W6EJJ - Director; S.W. Division
John Lindholm, W1XX - ARRL Communications Mgr.
Data Communications Conference participants

***** KA6M/R PACKET REPEATER INFORMATION *****

from Homebrew Computer Club NL

The KA6M repeater is San Francisco's first, and possibly the nation's first, all digital simplex packet radio repeater for use in amateur radio. The repeater went into operation on December 10th, 1980 and since then has been running both as a packet repeater and a beacon. Here are some facts about the repeater and its operation:

- A packet radio repeater or digital repeater or "digipeater", as the Canadians call it, is a machine which receives a message or block of data, and after verification, retransmits that message on the same frequency channel where it was received. Thus, only a simplex channel is used, and the message transmitted is the same as the message received, except for the possible modification of some address or control bytes. The primary function of a packet repeater, as with a more conventional repeater, is to extend the geographic range and coverage of fixed or mobile stations.

- The KA6M/R repeater is currently operating on a simplex channel assigned for non-voice use, 146.580 MHz., and transmits data at a speed of 1200 Baud. The machine consists of a Z-80 microprocessor, a Bell 202 compatible modem, and a solid-state transceiver. The initial site is in Menlo Park, CA.

- The basic format of a packet or message block is an HDLC frame. The word HDLC stands for High-level Data Link Control which is a new and internationally recognized standard in the communications industry. A frame consists of an opening

flag byte, an address byte, a control byte, an information field, two bytes of CRC checking, and a closing flag. The repeater uses NRZI (Non Return to Zero Inverting) encoding of the frame, which allows both clock and data to be recovered from one signal. The use of HDLC framing and control procedures guarantees highly reliable, nearly error free communications. The first use of HDLC framing by amateurs was done by members of the Vancouver Digital Communications Group, and we are following their lead.

- As a beacon the machine transmits three packets every 5 minutes, immediately following its CW id. Each packet contains approximately seventy ASCII characters. In functioning as a repeater, the machine will repeat any packet it receives which has the correct address and CRC checksum. The information field is currently limited to 256 bytes maximum.

- The control software for the repeater is written in PASCAL/Z, a PASCAL which generates native Z-80 code instructions. Assembly language interface routines have been written to control a Western Digital 1933 HDLC chip.

This repeater is just a first step in what will someday be a nationwide network of interconnected computer systems. Packet radio is a new frontier for amateur radio, a new medium unlike anything we are accustomed to today.

Please contact me if you are interested in more information about the repeater or wish to communicate with it.

Hank Magnuski, KA6M, 311 Stanford Ave., Menlo Park, CA 94025 * (415) 854-1927

AMRAD

Amateur Radio Research and Development Corporation

Membership Application/Renewal

Mail to: Gerald Adkins, Treasurer
1206 Livingston St N
Arlington, VA 22205

See reverse for
overseas mailing
rates.

	Annual	Life
Dues: Regular	\$12	\$120
2nd in family	6	60
Full-time student	3	-

Please make checks payable to AMRAD.

Name _____
Ham _____ Home _____
Call _____ Phone() _____

Address _____
City, _____
State _____ ZIP _____

I agree to support the purposes of the Corporation.

Class License _____ ☐ ARRL Member
Have: ☐ 2-meter FM ☐ RTTY
☐ Computer model _____
Microprocessor type _____

Signature _____

THE AMATEUR RADIO RESEARCH AND DEVELOPMENT CORPORATION is a technically oriented club of about 300 radio and computer amateurs. It is incorporated in the Commonwealth of Virginia and is recognized by the Internal Revenue Service as a tax-exempt scientific and educational organization.

THE PURPOSES OF THE CLUB are to: develop skills and knowledge in radio and electronic technology; advocate design of experimental equipment and techniques; promote basic and applied research; organize forums and technical symposiums; collect and disseminate technical information; and, provide experimental repeaters.

MEETINGS ARE ON 1st MONDAY of each month at 7:30 p.m. at the Patrick Henry Branch Library, 101 Maple Ave E, Vienna, VA. If the 1st Monday is a holiday, an alternate date will be announced in the *AMRAD Newsletter*. Except for the annual meeting in December, meetings are normally reserved for technical talks - not business.

THE WD4IWG/R REPEATER is an open repeater for data communications (including RTTY), voice and experimental modes. It is located at Tyson's Corner, McLean, VA and has excellent coverage. It features a semi-private autopatch available to licensed members. Frequencies are: 147.81 MHz input, 147.21 MHz output. The head of the technical committee is Jeff Brennan, WB4WLW, 7817 Bristow Dr, Annandale, VA 22003, phone 703-354-8541.

THE AMRAD NEWSLETTER is mailed monthly to all members and to other clubs on an exchange basis. Technical articles, new product announcements, news items, calls for papers and other copy related to amateur radio and computing are welcome. Honorariums at a rate of \$10 per printed page (\$20 maximum per author per issue) are paid for original material accepted. Classified ads are free to members. Commercial ad inquiries are invited. The editor reserves the right to reject or edit any portions of the copy. Items should be mailed by the 8th of the preceeding month to Paul L. Rinaldo, W4RI, Editor, 1524 Springvale Ave, McLean, VA 22101; phone 703-356-8918. Full permission for reprinting or quoting items appearing in the *AMRAD Newsletter* is granted provided that credit is given. Mailing is by 3rd Class bulk mail to U.S. addresses and 1st Class to Canada and Mexico. Overseas readers add 96¢ for surface or \$7.80 for air mail to annual dues.

THE AMRAD MESSAGE SYSTEM is an S-100 Computerized Bulletin Board System on 703-734-1387, system operator Terry Fox, WB4JFI. Terry's home phone number is 703-356-8334. The system accepts 110, 300, 450 and 600 baud ASCII callers using Bell 103-compatible modems.

THE HANDICAPPED EDUCATION EXCHANGE (HEX) is operated by AMRAD for those involved in education and communications for the handicapped. It accepts both 110/300-baud ASCII and deaf TTY callers. on 301-593-7033. The sysop Dick Barth, W3HWN's home phone is 301-681-7372.

AMRAD OFFICERS for 1981 are:
Gerald Adkins, N4GA Treasurer
Jeffrey Brennan, WB4WLW Director
Repeater Trustee
Tedd Riggs, KA4FYU Librarian
Robert E. Bruninga, WB4APR Director
VP-Asia
Kenneth Coghill, WB4ZOH 1st Alt.
Terry Fox, WB4JFI Director
Vice Pres.
Computer Trustee
William Pala, Jr., WB4NFB Director
Secretary
Paul L. Rinaldo, W4RI Director
President
Elton A. Sanders, Jr., WB5MMB 2nd Alt.

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AMRAD IS AFFILIATED with the American Radio Relay League (ARRL), the Foundation for Amateur Radio, the Northern Virginia Radio Council (NOVARC) and The Mid Atlantic Repeater Council (T-MARC).

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